THE UNIVERSITY OF CHICAGO

ROUND TABLE

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HEART DISEASE

What the Public Should Know

A Radio Discussion by

DR. EMMET BAY, DR. GEORGE FENN
DR. STANLEY GIBSON *and* DR. LOUIS KATZ

Including
A Special Supplement
on
HEART DISEASE

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Heart Disease: What the Public Should Know

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DR. BAY: This past week has been National Heart Week. The newspapers, the radio, and public meetings, sponsored by the American and by local heart associations, have all stressed the fact that diseases of the heart or of blood vessels are the number-one killer. Over one-half million people in 1946 died of diseases of the heart and blood vessels. This is a larger number than died of the next five causes of death combined. By 1970, twenty-two short years away, I estimate that more than three million of our people will be incapacitated by these troubles at any one time in a way which will require nursing care in the home or in an institution. This is just about two million six hundred thousand more than the number of institution beds available for all sicknesses in the United States today.

You can see that heart disease is unquestionably the nation's number-one public health problem. I would like to stress that word "public." Heart disease occurs in all our families—rich and poor, urban and rural, colored and white. We all have a stake in doing something about it.

Dr. Gibson, you are an expert in diseases of children. Tell us about heart diseases in children.

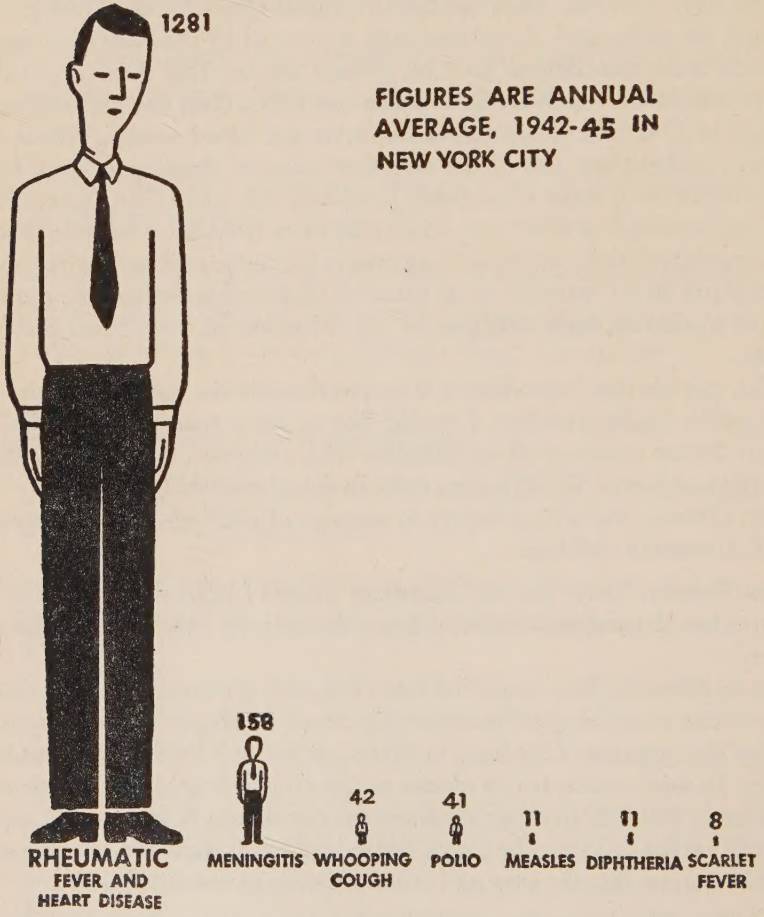
DR. GIBSON: There are two important forms of heart diseases in children. One of these is congenital heart disease; the other is rheumatic fever.

As its name implies, congenital heart disease is present at birth. By this I mean that something in the course of prenatal development goes wrong, so that the structure of the heart or of the great vessels leaving the heart is faulty. In some instances this disease causes no handicap, and the patient lives out a full life. In other instances the circulation is so seriously impaired that the child may be compelled to lead a very quiet life, altogether unable to enter into the play and other activities of normal children.

DR. BAY: Nearly one thousand cases, however, of congenital heart disease—some of them "blue babies"—who formerly were doomed, have, in the past few years, been benefited by an operation. Tell us about these.

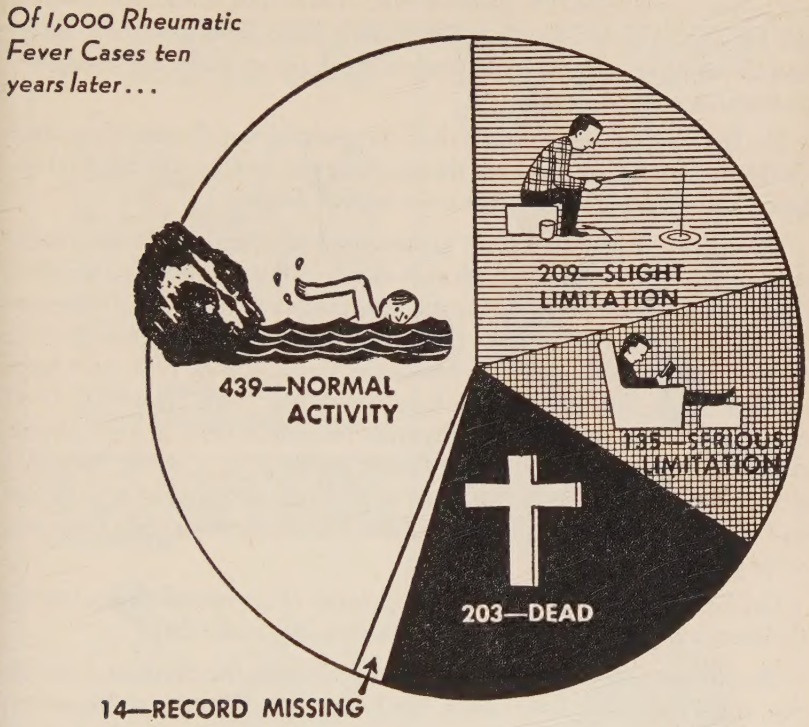
DR. GIBSON: One of the most spectacular advances in surgery in recent years has been in the correction of defects involving the heart and the

DEATHS FROM RHEUMATIC FEVER COMPARED WITH OTHER CHILDHOOD DISEASES



Reprinted from Herbert Yahraes, *Rheumatic Fever: Childhood's Greatest Enemy* ("Public Affairs Pamphlet," No. 126 [New York, 1947]).

MANY RHEUMATIC FEVER CHILDREN RECOVER AND LIVE NORMAL LIVES



Ibid.

great vessels which carry the blood from the heart. The blue-baby operation is the most important one and has attracted the greatest public interest. This brilliant operation, conceived and carried out by Dr. Taussig and Dr. Blalock, has transformed many of these patients from a state of complete or partial helplessness to that of relatively normal children who are able to lead active lives.

DR. BAY: Dr. Potts and Dr. Smith, working with you at the Children's Memorial Hospital, have developed a new technique for operating upon these children. How was this perfected?

DR. GIBSON: The operation was performed on thirty-two dogs before

our first patient was submitted to surgery. Since I am a lover of dogs, I am happy to add in passing that several of the dogs are still alive and well after almost two years. The public should realize that neither Dr. Blalock nor Dr. Potts nor Dr. Smith could possibly have developed their operation for children without experimental work on animals. No animals—no research in heart disease.

DR. BAY: Far more important than congenital heart disease is the chief disabler and killer of children, rheumatic fever, and its aftermath, rheumatic heart disease. What is the story on this disease?

DR. GIBSON: Rheumatic fever causes about one-third of the total number of cases of heart disease. Each year in this country almost two hundred thousand people die from rheumatic fever. In New York City, in the ten-year period from 1930 to 1940, there were six hundred and ninety-three deaths from infantile paralysis; but in the single year of 1938 there were in New York City over eleven hundred deaths from rheumatic fever alone. In other words, the mortality from rheumatic fever in a single year was almost double that due to infantile paralysis in a whole decade. I wonder how many realize that, even in children between the ages of five and fifteen years, more children die from rheumatic fever than from any other disease.

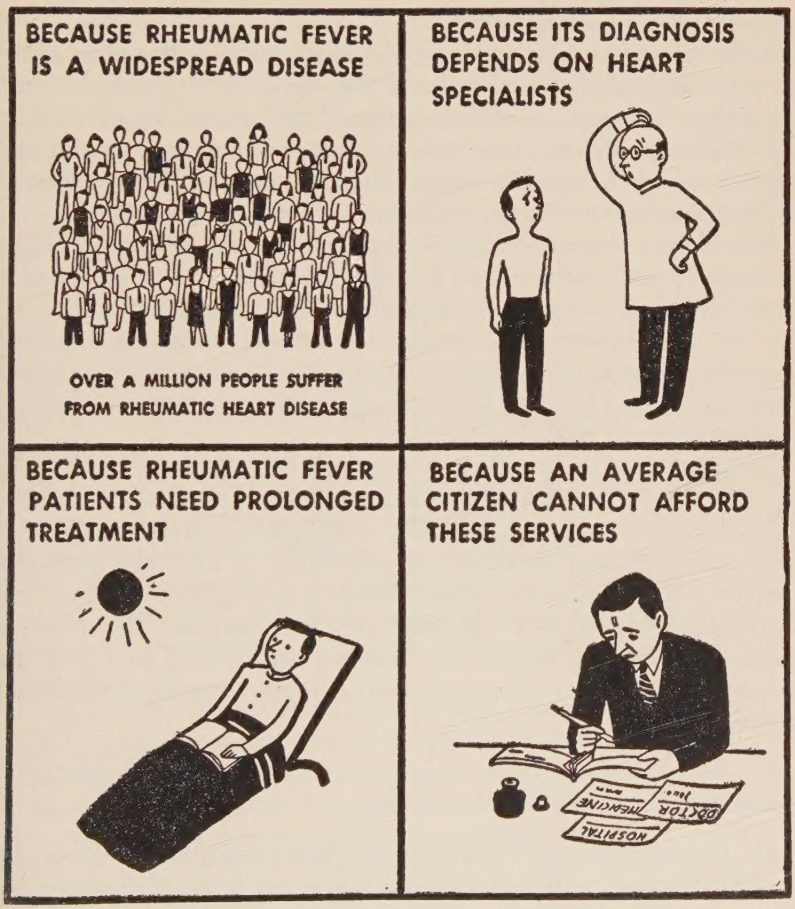
DR. BAY: We do not know the exact cause of rheumatic fever, but we do know a lot about its predisposing factors. What are they?

DR. GIBSON: Yes, we do know a good deal about the circumstances under which rheumatic fever arises. We know that climate is an important factor. It is in the temperate zones, where the weather is changeable, where there is cold and rain and snow and slush, that rheumatic fever is most frequent. We know that poor living conditions have much to do with its occurrence. We know that heredity is a factor. We know that certain streptococcic infections, particularly a sore throat and tonsilitis, almost always precede, by a few weeks, the actual onset of rheumatic fever. However, we do not know why, out of the many children who contract streptococcic infections, only certain ones will come down with rheumatic fever.

DR. BAY: As a pediatrician, what do you tell parents to look out for as the early signs of rheumatic fever?

DR. GIBSON: First of all, parents should know that rheumatic heart disease is a treacherous enemy. In the great majority of cases there is no

WHY A PUBLIC HEALTH PROGRAM FOR RHEUMATIC FEVER IS NEEDED


BECAUSE RHEUMATIC FEVER IS A WIDESPREAD DISEASE
OVER A MILLION PEOPLE SUFFER FROM RHEUMATIC HEART DISEASE
BECAUSE ITS DIAGNOSIS DEPENDS ON HEART SPECIALISTS
BECAUSE RHEUMATIC FEVER PATIENTS NEED PROLONGED TREATMENT
BECAUSE AN AVERAGE CITIZEN CANNOT AFFORD THESE SERVICES
HOSPITAL
DOCTOR
MEDICINE

Ibid.

pain or any other symptom of distress pointing to the heart, even when the heart is seriously involved. There are, however, two important manifestations of rheumatic fever which can be recognized. Parents should know that joint pains, usually involving several joints in rapid succession, may mean the onslaught of a rheumatic attack. Parents should know that another sign of rheumatic fever is chorea, or St. Vitus' dance. I hope that

every parent listening to this broadcast will remember that either fleeting pains in the joints or the nervous twitchings which portray the presence of chorea are danger signals which mean that the heart is in danger or, indeed, may be already involved.

If rheumatic fever can be detected at its onset and if the proper measures are instituted, the involvement of the heart may be greatly lessened or, in some instances, avoided altogether. This is where the parents' responsibility lies. Parents should know that the child must be at complete bed rest during the period of active infection. Under such circumstances the heart has less work to do, and less serious damage will result.

One of the unfortunate features of rheumatic fever is its tendency to recur; and it is the recurrence of the infection which we fear. How can it be avoided? Improving the environment of the patient is important. Giving him an adequate and properly balanced diet is important. I have pointed out that an infection with a streptococcus germ usually precedes rheumatic fever. Therefore, if we can prevent the streptococcic infection, rheumatic fever is unlikely to develop.

Fortunately, we do have drugs, particularly the sulfa drugs and penicillin, which are effective against a streptococcus. Well-controlled experiments have shown that the use of these drugs, given in proper dosage over long periods of time, has decreased very materially recurrent attacks of rheumatic fever. It should be emphasized, however, that these drugs are worthless during the period of active infection. Moreover, they must be given under medical supervision. They are not the final answer to the problem, but they give promise of being effective weapons until we find a better way.

DR. BAY: Everybody knows about heart murmurs. What is your experience with heart murmurs in children?

DR. GIBSON: Parents should know that heart murmurs are extremely frequent in children. In fact, a faint murmur can be heard in more than 50 per cent of healthy children. I cannot emphasize too strongly that the presence of a heart murmur does not necessarily mean that the child has heart disease. The significance of a heart murmur must be determined by its quality, its timing, its location, and by the other signs which may accompany it.

DR. BAY: The bulk of heart disease occurs in adults. Dr. Fenn, who is interested in this group, will tell us about them.

DR. FENN: The most important forms of heart disease in adults are high blood pressure, hardening of the arteries, which includes diseases of the arteries nourishing the heart muscles, the coronary arteries, and, of course, rheumatic heart disease.

There was an altogether unexpected amount of rheumatic fever in the Army and Navy during the last war, but relatively little heart disease resulted. The first attack of rheumatic fever may come on in adult life and frequently does; but serious heart disease is less likely to result in the person whose initial attack is postponed until then. It is the person who grows up from childhood with rheumatic heart disease with whom we are most concerned. They may acquire high blood pressure or coronary artery disease just like anyone else, and we do not like that. Therefore, the control of rheumatic fever and the prevention of rheumatic heart disease are of vital importance to us who deal only with results.

DR. BAY: The outlook for patients with high blood pressure and coronary thrombosis has improved greatly in my professional lifetime. Tell us about some of these changes.

DR. FENN: Very definite advances have been made in the management of certain types of heart disease. A generation ago, certain disorders of the thyroid gland often produced serious, sometimes fatal, heart disease. These thyroid disorders have yielded, first, to surgery; and now they are being attacked with new chemical preparations and with radioactive drugs with great promise of success. Thyroid heart disease is almost a thing of the past.

The same is true of syphilitic heart disease. New methods of attack on syphilis have brought about a great diminution in the case of heart disease from this source.

Ten years ago, subacute bacterial endocarditis, which is an infection of the valves of the heart, was an almost uniformly fatal disease. The sulfa drugs made a dent in this mortality, and now penicillin has brought the disease under very good control. These are positive advances which we now take for granted, but I suspect the situation with regard to them looked very discouraging to our grandparents.

The progress in the elimination of high blood pressure and coronary artery disease has been less spectacular but nonetheless real. These, strictly speaking, are not primarily diseases of the heart at all. They are fundamentally diseases of blood vessels from which the heart ultimately suffers.

DR. BAY: I remember one of my best teachers saying, in 1922, that a

man with certain symptoms as a result of high blood pressure could not live more than a year and a half. I have a patient who is now working full time, who had those symptoms in 1941, six and a half years ago.

DR. FENN: High blood pressure is a sign of a disease in which the elevation of the blood pressure is one of the early symptoms and a symptom with which most people are acquainted. I believe that there is a great deal of misinformation abroad concerning blood pressure. It is not a fixed thing in any person, and it varies, normally, through a rather wide range. It may be fifteen or more points higher or lower today than it was yesterday and still be normal on both occasions. Also, the old, popular formula that the normal blood pressure is one hundred plus your age should be placed with other fairy stories where it properly belongs.

The regulation of the blood pressure is quite a complex matter, and, when something happens to upset the regulating mechanism, the result is likely to be an elevation of blood pressure beyond the normal limit. In some instances we are able to discover what it is which interferes with the blood-pressure regulation. Certain diseases of the kidney or urinary tract may be found. Tumors of the adrenal gland or tumors of the pituitary gland may be responsible. If the fundamental cause is discovered, it is very often possible to overcome the high blood pressure. In the majority of cases, however, the fundamental cause remains obscure, and this problem is the object of a lot of research and investigation.

While the fundamental cause remains obscure, we treat the symptoms as they arise. Attempts are made to lower the blood pressure when we think lowering may prevent some of the unpleasant things which go along with this disease. Many, many people, however, live out their life-expectancy, together with their high blood pressure, and with little if any discomfort. Drugs will lower the blood pressure in some instances. Some of the newer drugs which are still in the experimental stage seem to exert a profound effect upon the blood pressure. It may be that this answer will come through the use of some chemical agent. Diet has swung both ways. Used widely many years ago, it then came to be almost completely disregarded. In the last few years, diet has again come on the stage. These new diets, such as the lower salt diet, must be still considered experimental. Everyone agrees, however, that overweight must be abolished.

Surgery on the nerves of the blood vessels is effective in properly selected cases of high blood pressure and in other diseases of the blood vessels of the arms and legs.

Lastly, there must be mental discipline, mental tranquillity, and a realization of the fact that one's life habits must often be greatly altered. The patient should learn to relax, should adopt avocations; and, when he drinks, he should drink like a gentleman.

Coronary artery disease is no less important. This disease attacks the same group as high blood pressure disease. This disorder has to do with an interference of the blood supply to the heart. Perhaps the most serious phase of this disorder is the occurrence of coronary thrombosis, where the blood supply to a portion of the heart is suddenly cut off by plugging one of the coronary arteries. This accident frequently occurs without warning. Again, the fundamental cause is obscure. Ancestry may play a part; diet may be involved; the tempo at which we live has been blamed. But none of these has been definitely proved. This is one of the problems which remains to be solved.

Twenty years ago coronary thrombosis was a highly fatal accident. Today the deaths from this accident are materially less percentagewise. Twenty years ago the patient with coronary thrombosis looked forward to a life of invalidism if he survived his attack. Today, most of those persons are continuing to carry on their activities, and many of them are living out their life-expectancies, and more. You might be surprised to know how many of your friends had experienced a coronary thrombosis. More intelligent treatment and management allow them to go on much as they did before the attack.

These diseases, however, are the ones which too often take the executive from his business. They affect us all by removing the public servant from his duties and cause distress by too often impairing the efficiency of the family breadwinner.

Lastly, there has been progress in the treatment of heart failure. All persons with heart disease, you know, do not have heart failure. Heart failure exists when the heart is no longer able to overcome the obstacles of heart disease and no longer able to do its work efficiently. Years ago, heart failure signified that the patient was finished, as Dr. Bay just remarked. Today, owing to more efficient methods of treatment and management, patients recover from heart failure and go about their business for years.

Yes, progress has been made, but not enough.

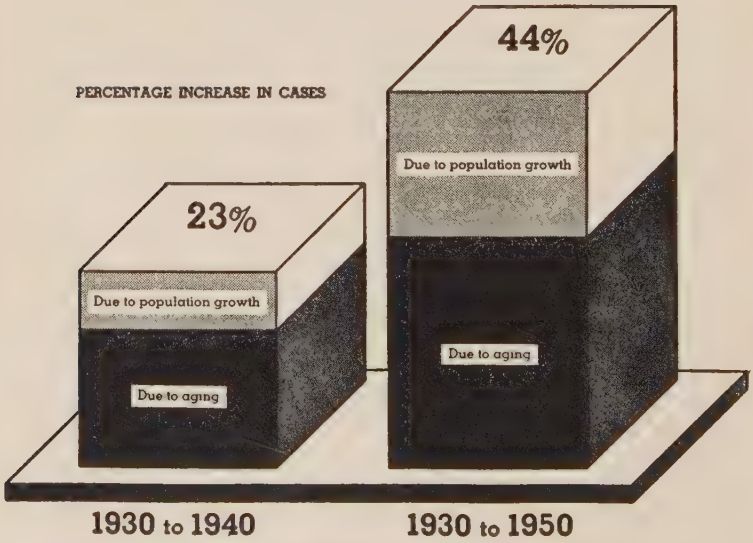
DR. BAY: Since many people have misconceptions about irregularities of the heartbeat, will you say something about these?

HEART DISEASE IN THE UNITED STATES

PREVALENCE
GENERAL TREND

About 4,000,000 persons in the United States are estimated to have heart disease. The number of cases has been growing principally because of:

1. **The aging of the population**
2. **The increase in the total population**

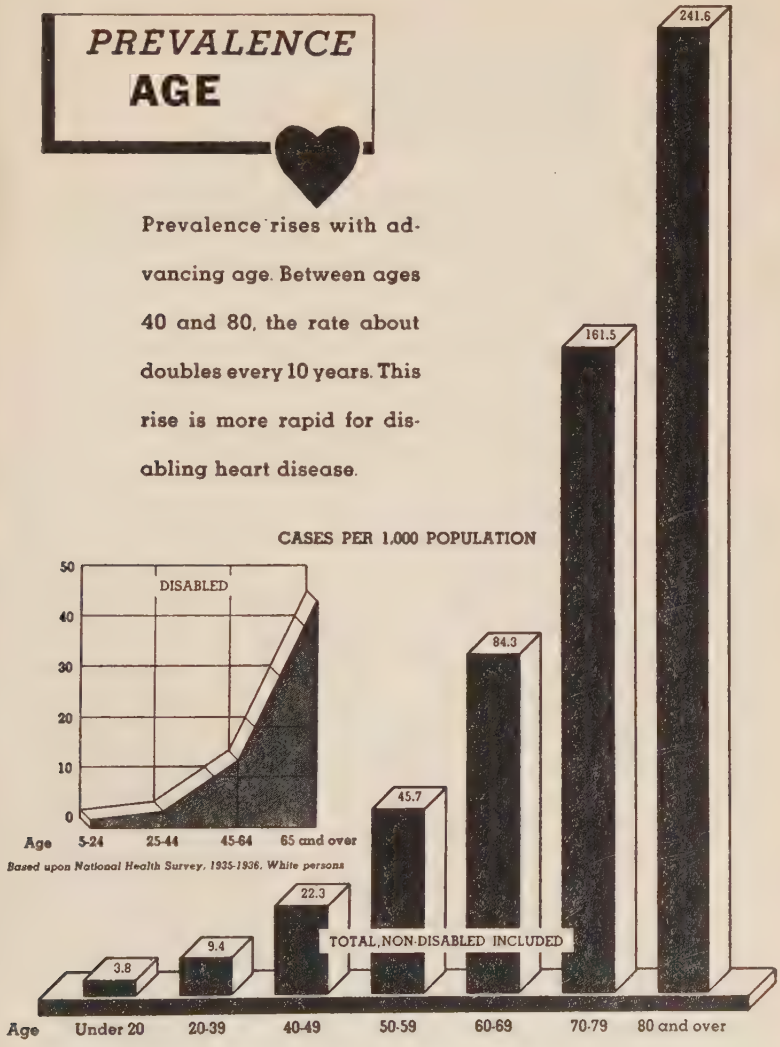


Estimates are based upon the Massachusetts Chronic Disease Survey, 1929. Reprinted by special permission of the Metropolitan Life Insurance Company, *Studies in Heart Disease* (New York: Metropolitan Life Insurance Co., 1946).

HEART DISEASE IN THE UNITED STATES

PREVALENCE
AGE

Prevalence rises with advancing age. Between ages 40 and 80, the rate about doubles every 10 years. This rise is more rapid for disabling heart disease.



Ibid.

DR. FENN: Irregularity of the heartbeat is not itself a sign of heart disease. Irregularity is a perfectly normal thing in the majority of instances. If one does get such action, one should consult his physician to determine whether or not the irregularity has any significance.

DR. KATZ: We have been talking about people with organic disease. Dr. Bay, you have had a long interest in people who have had overanxiety about their hearts and were thus incapacitated.

DR. BAY: Yes, the problem of anxiety, with or without heart disease, is a real one. Dr. Gibson has told us of unimportant heart murmurs. They may be unimportant as to the structure and function of the heart, but they frequently modify the lives of patients all out of proportion to the actual damage which exists.

The most dramatic instance of this which I recall happened some years ago. A father and mother brought their five-year-old son to see my teacher, Dr. Herrick, because they had been told that the child had a heart murmur and that he should be restricted in his play and work. Dr. Herrick asked the child what was bothering him, and the child cringed forward, placed both hands on his left chest, and said, "My heart!" Dr. Herrick, after examining the child and ascertaining that he had no organic heart disease, put the child out of the room and gave the parents both barrels. If he had had the doctor there who had made both parents and the child so overanxious, I am sure that it would have been a broadside.

This fortunately rare instance of a heart neurosis in a child of five is duplicated many times in the adults. Many adults are overanxious about a heart murmur, but many of these with a functional or accidental murmur, are better bets for living out a normal life-span than those who are without the murmurs. Yet, the knowledge that they have a heart murmur is incapacitating to many of them.

The solution to this problem can be found only by an examination, by a good doctor, and then believing and accepting his word on what the situation is. In this same vein I should like to be very frank in saying that I think that patients who desire so-called "health examinations" should be very careful to pick doctors who are not pessimists and alarmists.

Still in the spirit of self-criticism, I wish to pose a question to Dr. Katz. You have had a lot of experience in clinical electrocardiography as well as in research. Before we talk about research, I should like to ask you what you think about the use of laboratory tests in arriving at a diagnosis. I am

under the impression that the electrocardiogram is frequently abused. Is that right?

DR. KATZ: Yes, it is. Laboratory tools are aids. Their interpretation is subjective, just as is the interpretation of clinical findings on percussion and on listening to the heart. There is no substitute for the modern, well-trained physician. Too many lay people, and too many doctors, unfortunately, expect to make a diagnosis by using tools. They somehow think that, by using a tool and by running it through a statistical machine, the diagnosis and the treatment will come out. That is wrong! Tools are devices to help, but that is all they do. It is the physician who must make the final decision.

DR. BAY: I should like to tell our listeners that Dr. Katz differs from Dr. Fenn and Dr. Gibson and me in that he is not in practice. He reverses the process that we have described. He uses patients, as is done in many institutions, for clinical investigation to confirm facts which he finds on his animals. What has been accomplished recently in research in the field of heart disease?

DR. KATZ: What the three of you have said has illustrated what research has done in developing modern cardiology and blood-vessel disease. I could spend an hour or two going over some of the recent subjects which are under investigation and which offer real promise. They are such that most of us in the research field are very optimistic about the future in research. All the recent advances in diagnosis and treatment of heart disease, as I say, have come about from research. The vistas are large, but I would like to mention just a few. For example, anticoagulants —drugs like heparin and Dicumarol—have been used recently to prevent the blood from clotting. These have been used in cases in which clots migrate from one spot in the circulatory system to another. They have been used in recent coronary occlusion or thrombosis. As a matter of fact, there are seventeen institutions who have been cooperating with the American Heart Association in studying the value of these types of therapy. Over one thousand patients have been investigated. In about two or three or fourth months the study will be finished. If the final results are as good as the preliminary evidence seems to point, we will have a real advance in the treatment of this form of heart disease. However, unfortunately, I must point out that such a use of drugs will not be available for the practitioner and the home because the blood-clotting must be determined every day by physicians.

In addition, I would like to mention a few other techniques, developed by recent research work. The passing of a tube into the blood vessel to get the blood pressure in the heart or to get the oxygen content in the various chambers of the heart and the injection of material which can permit X-rays to be taken of the cavities of the heart offer real possibilities for the future.

There is the electrokymograph, a device to get the motion of the borders of the heart with the photoelectric cell, which is something very new. There is the electrocardiograph, which tells us about irregularities of the heart, about damage to the heart, and about heart strain. There are the studies in arteriosclerosis, with a demonstration that cholesterol will cause hardening of the arteries, which is arteriosclerosis. There is the use of salt in heart failure; the role of the kidney in heart failure; and there is the use of diet and surgery in high blood pressure.

DR. BAY: How is research work on high blood pressure actually done?

DR. KATZ: High blood pressure is a very good example of the value of modern research. Without the ability to do experimentation on animals, research would have been stymied. By tying the blood vessels to the kidney in the dog and the cat and the rabbit and the rat, we have been able to produce high blood pressure in these animals which is very similar to that occurring in man. By wrapping materials like parchment around the kidneys, this also has been accomplished. By cutting certain nerves which supply the blood vessels and regulate blood pressure, hypertension or high blood pressure, has been produced. Feeding salt to chickens, we have been able in my own laboratory to cause high blood pressure. Animals for these studies are trained so that they come to lie on the table and permit, without any objection, the passing of a needle into the artery to obtain the blood pressure. I have had some animals for five or more years. As a matter of fact, there was one dog which ran away for a bit on a "bust" and then came back asking to be taken into the institution.

In the case of chickens and rabbits, they are hypnotized. In the case of rats, a blood-pressure cup is put around the tail. With such methods, the chemicals and enzymes responsible for the kidney form of high blood pressure have been determined. These have been prepared in pure form. Other kidney extracts have been obtained. Kidney clearances—that is, the functions of the kidney—have been determined. The blood vessels have been denervated in animals to lower blood pressure; and this has been done in man. Diet has been studied in the animal and also in man—low

salt and low protein diets—but these are still experimental. The psychoanalyst and the psychiatrist have thought that the emotions play a great role in determining high blood pressure, and this, too, is under investigation.

But, behind it all, has been the basic and fundamental research on the control of the blood pressure on animals, because without such knowledge we would have gotten nowhere in high blood pressure.

DR. BAY: What does it actually take to do research?

DR. KATZ: It takes, first, an investigator—an investigator who is trained in the know-how of research. He must have knowledge of biology, embryology, pathology, physiology, bacteriology, surgery, anesthetics, X-ray, physics, chemistry, and the like, or experts in these fields upon whom he may call. Hence, such institutions in research should be near medical schools or in general research institutions.

The investigator must be a clinician, an M.D.; hence, he should work in a hospital. His income should be adequate so that he need not worry about his livelihood. He needs lots of technicians and other help. He needs the services of a general hospital. He needs beds for patients. He needs an out-patient department for ambulatory patients. He needs animal laboratories and an animal hospital. He needs equipment for these laboratories. I would estimate, for example, that my laboratory cost about fifty thousand dollars. Ideally, all these should be in one institution where all the personnel in the various fields can concentrate. The only place in the Western Hemisphere that I have seen, and the best in the world, is an institute for heart disease in Mexico City. I am trying to get such an institution at my own hospital.

But it is not only a matter of equipment; it is the men whom we need for research—men who are leaders.

DR. BAY: How adequate are the facilities to train young men for research in the diseases of the heart and blood vessels? What money is available for heart research now?

DR. KATZ: Facilities are inadequate. The opportunities for important research positions are too few in number. Starting salaries are not large enough, and there is need to increase them, particularly when the man is well trained. There are only about one hundred men studying heart and blood-vessel disease—half of them working in hospitals. The more brains at work, the more intelligence applied, the sooner the solution. I could use two or three times as much personnel in my own department.

The public should do something about this. Considering that diseases of the heart and blood vessels kill more than one-third of all people, that fifty-eight million people now alive will die of this disease, that nine million people now suffer from it, there are too few M.D.'s concerned with it. Seven hundred M.D.'s are specializing in this disease. One hundred investigators are studying it. Only two hundred hospital beds are available. Less than three million dollars is used for research—five dollars per death. In infantile paralysis, five hundred thousand dollars is used per death. If heart disease is to be supported in the same proportion, there should be one hundred and sixty million dollars instead of three million. I hope that people realize these facts.

I should like, in bringing this statement of mine to a conclusion, to state that, great as have been the discoveries during the past quarter of a century in the field of heart disease, there remain tremendous unexplored fields which need thorough and intensive research by large groups of skilled investigators. While much needs to be done in improving diagnosis and treatment, the greatest advance will come only from fundamental answers to these questions: Why high blood pressure? Why hardening of the arteries? What is the cause of rheumatic fever? Let us hope that we get support for these particular things.

DR. BAY: Dr. Fenn, I am going to give you the last word.

DR. FENN: I am glad to have the last word, and I want to make this final statement as president of the Chicago Heart Association. We have attempted to put some of the technical problems before you. You must see how badly your help is needed. Your interest will solve these problems, and you may make your interest known by contributing to the American Heart Association or to the local heart association in the area in which you live.

DR. BAY: Gentlemen, I wish to thank all of you for participating in this ROUND TABLE, on behalf of the University of Chicago. It has been a real pleasure to me.

A Special Supplement

on

HEART DISEASE

*

SOME ASPECTS OF THE NON-MEDICINAL MANAGEMENT OF HEART DISEASE*

EMMET B. BAY, M.D.

THE importance of drugs in the treatment of various forms of heart disease has long been well established. I do not wish to belittle their importance by limiting this discussion of treatment to the non-medicinal aspects of the care of the cardiac patient. There is currently an increasing interest among physicians and others in two subjects which together comprise the burden of this talk. These are:

(1) psychosomatic medicine and

(2) the early ambulation or activity of convalescent patients.

In attempting to apply these concepts to the field of heart disease we shall encounter much that is not new and much that is still not well understood quantitatively.

Although we shall consider the physical and mental activities of patients with heart disease separately, it is well to bear in mind that there is an interrelationship of greater or less importance between these in all patients. This interrelationship is best illustrated in the case of patients with neurocirculatory asthenia [a nervous disorder associated with heart symptoms]; for in these patients the physical activities are limited by the psychological reactions of the patient rather than by the organic changes in the circulatory system. These patients are more acutely aware of discomfort, including palpitation of the heart, than normal persons and simply will not undertake work or exercise which their hearts could be trained to stand.

At the opposite pole of this interplay between physical and mental factors in the lives of patients with heart disease is the patient whose persistent, ignorant self-assurance makes him unamenable to suggested limitations of his physical activity. There are many gradations between these, some of which we

*Reprinted by special permission from the *Chicago Heart Association Bulletin,* July–December, 1944.

shall touch upon later when we consider the impact of psychosomatic medicine on the field of heart disease.

The management of the physical activities of patients with all forms of heart disease can conveniently be divided into two main sub-heads:

(1) the activities of ambulatory patients and
(2) the care of the bed-ridden patient.

ACTIVITY OF PATIENTS UP AND ABOUT

We can make some generalizations about the management of ambulatory patients irrespective of the cause of the heart affliction. It is probably wise to urge such patients, whether they are in danger of congestive heart failure or of anginal pain, to limit their activities so that they do not show certain symptoms. In the case of patients with rheumatic, hypertensive or arteriosclerotic heart disease whose complaints and physical findings suggest the imminence of heart failure, shortness of breath (which persists for more than a few seconds after a given activity) should be a danger signal to the patient. In these same patients pounding of the heart is not nearly as satisfactory a guide for determining the amount of activity. In fact, an excessive awareness of the heart beat, heart consciousness, is one of the symptoms of a cardiac neurosis superimposed upon organic heart disease. This latter combination will be discussed in greater detail when we consider the mental aspects of heart disease.

While it is desirable that patients with serious heart trouble refrain from activities producing serious symptoms, it is increasingly evident that patients with all forms of heart trouble should be active almost to the limits of their capacity. The current tendency is to permit children with inactive rheumatic heart disease and small hearts with good functional capacity, normal physical activities. There is some laboratory evidence to show that these activities change the body chemistry in ways that improve the heart muscle's use of energy (such as oxygen and sugar) when a state of good physical training is achieved.

The amount of physical activity which should be prescribed for a patient with organic heart disease depends on the judicious evaluation of several factors by a competent physician and not on any existing functional test. Among these factors are the history, the pulse rate and the size of the heart, as well as functional tests if the physician using the latter is familiar with them. On the whole, and especially in the case of younger patients, it is better to err on the side of optimism rather than pessimism when giving advice about exercise. By preference, however, patients with all forms of heart disease should be encouraged to cultivate a liking for the less competitive forms of exercise such as swimming, rowing for pleasure, hiking, horseback riding and others of a similar nature. These sports have the virtue from our present point of view that they may be varied in strenuousness as the patient grows older or his disease progresses with a minimum of reduction in recreational value.

BED REST

In considering the bed-ridden patient it is necessary to go into greater detail as to the cause of his trouble. In the case of the child with active rheumatic fever, there is no known substitute for rest in bed as the best means of terminating the activity of the disease and of minimizing the extent of heart damage. When the child becomes fever-free in the absence of salicylate medication, there is a difference of opinion among doctors as to the use of other criteria for his early ambulation. Some still insist on his remaining in bed until the white count and the erythrocyte sedimentation rate are both well within normal limits. At the other extreme is a group who believe that when the patient is symptom-free (including fever-free), for a week, he may begin to get up and about, irrespective of the sedimentation rate or white count. Certainly the period of rest in bed following active rheumatic fever has been shortened in most hospitals with advantage to the patient. Twenty years ago it was not uncommon to keep a child in bed as long as a year after an episode of rheumatic fever, with great detriment to his mental and physical development and with no obvious benefit to the number of possible recurrences. The period of bed rest following acute rheumatic fever should probably be modified if the patient has suffered the development of a new, or the extension of an old, cardiac involvement. In the absence of such cardiac manifestations it is probably safe to permit a child to be out of bed in the second or third week after joint pains and fever have subsided. He should, of course, remain under observation and at any sign of a recrudescence of the rheumatic process, including the development of changes in the heart, he should be put back to bed for a time.

In patients with congestive heart failure from whatever cause a period of bed rest together with proper medication is indicated. Recently it has been suggested that this too frequently results in the development of clots in the veins of the legs and that these may travel to the lungs with disastrous effects. While this does happen in the occasional case, it would appear to be not as dangerous as a program involving very much physical activity for a patient already in heart failure. It is possible that some very short exercises in bed with the legs counterbalanced by a system of pulleys and weights or counterbalancing each other by a system of pulleys only, might help prevent this complication without undue strain on the already overworked heart. In some places the practice of massaging the legs regularly during rest in bed as a result of heart failure has seemed to minimize this complicating feature.

The vast majority of patients who are going to recover from heart failure will begin to do so within a few days after they are put to bed, digitalized, and given diuretics. These patients usually become edema-free [free of dropsy] within one to four weeks, no matter how severe their anasarca [dropsy] may have been. It is usually safe to allow these patients to get out of bed one to two weeks after the disappearance of their edema and other symptoms.

In those patients in whom the restoration of cardiac reserve is going to be impossible in the sense that they can be made symptom-free while up and about, there comes a time some six to twelve weeks after they have been under adequate treatment for heart failure when it would seem to be desirable to allow them to be up by the bed-side and even to undertake a few small tasks in spite of the existence of residual symptoms. An exception to this is a condition such as post-operative constrictive pericarditis [the covering of the heart is plastered to the heart sac] where the period of heart failure may last for months before the benefits derived from the operation become apparent. There are a few patients with high-grade mitral stenosis [commonest valvular heart disease] who may survive for years in heart failure with some shortness of breath, cough and swelling of the ankles, whose hearts and livers are very big and yet who can lead surprisingly interesting and happy lives when they are up and about. Protracted periods of bed rest may not alleviate symptoms of these patients.

When a patient with an acute coronary occlusion is put to bed, the pathology in his heart muscle makes it imperative that he have as nearly absolute bed rest as is possible to achieve for a period for at least four weeks. During this time the withered portion of the heart muscle is soft and friable. It is only toward the end of the period that the interlacing cells which are going to complete the scar essential to healing become a sufficiently strong matrix to warrant any increased load on the heart. While it is true that before the diagnosis was regularly made clinically patients with this trouble occasionally survived, although active during the healing period, it is not good practice to permit this once the diagnosis has been made. In very severe cases, where it is clear that the amount of heart muscle damaged is large and heart failure develops early in the course of the disease, the patient should be fed while in bed for two or three weeks. Even in these patients it is sometimes necessary to compromise with respect to the completeness of their bed rest in the matter of obtaining satisfactory bowel action. Some of them exert more effort struggling on a bed-pan than they do getting out of bed to a commode at the bed-side. If there is no evidence of heart failure the patient with a coronary thrombosis may be allowed to get out of bed some five to six weeks after the onset.

WHAT THE PATIENT THINKS

Psychosomatic medicine is being touted as a new development in the science when, as a matter of fact, the principles underlying it are among the earliest heritages of the profession. Good doctors have always known that organic disease frequently disturbed patients' minds and have believed that emotional disturbances could be related etiologically to disturbances of function which could be precursors of organic disease. No harm will come of recent tendencies to stress these points if the proponents restrain their impulses to establish a new specialty in medicine devoted to this combination.

In the field of cardiology the relation between the patient's mind and his heart is of great importance. It is probable, for example, that many cases of hypertension and some cases of hyperthyroidism are directly related to the patient's emotional state. Contrariwise, in the presence of organic disease such as rheumatic heart disease, congenital heart disease, or arteriosclerotic heart disease the patient's psyche is of great importance in determining the course of the disease. Physicians, nurses and social workers have a great responsibility in helping to care for patients with heart disease to make sure that they do not initiate or greatly add to the emotional component of the disease. Unfortunately, many a patient has been largely disabled by virtue of the cardiac neurosis produced or augmented by his physician in the presence of an inconsequential organic heart disease. Examinations for military service, for employment and for insurance not infrequently are the starting points of these anxiety neuroses in patients who actually have nothing to fear. Fortunately, it is often possible by strong reassurance, sometimes backed up by otherwise needless laboratory tests, to remove such apprehensions before they become irrevocably fixed. Sometimes such reassurances must be repeated at longer or shorter intervals and rarely the neurosis originating in this manner becomes serious enough to require psychiatric help.

In the management of the patient with more severe organic heart disease it is important that all concerned in his care cooperate to minimize his understandable tendency to be afraid.

THE CHILD WITH HEART DISEASE

In the case of children with heart disease it would seem to be particularly important that their activities be restricted only when necessary and that it be done without inculcating fear or self-pity. They should be made to feel that they are normal in every way except for this one handicap and that it is compatible with a long and useful life. The question as to whether this is better done by segregation in special schools, for example, or by retention with their completely normal fellows in regular schools is one which requires acute clinical judgment; its answer must be highly individualized and depends on the child's mental make-up as well as on the severity of his heart lesion.

One of the comparatively difficult problems in managing children with heart disease is the re-direction of interests from physical careers to mental ones. Heart disease can occur in children destined to be adults with strong backs and weak minds. If the heart trouble is at all severe, the results are frequently tragic. The best one can do is to attempt to find some sedentary interest which the child might follow in later life, becoming increasingly forthright to the child as he approaches maturity.

A new technique being used in England, and to some extent in this country with certain types of patients being discharged from the services, is group psychotherapy. This seems to be most effective when patients with similar

disorders are brought together for a brief lecture and a question-and-answe session. It is probable that the special school for cardiac children serves thi function in an informal way so that the children realize that there are other who share their difficulties and get along successfully with them. Unless the children were carefully selected with respect to their emotional stability, i would probably be unwise to formalize this procedure in the special schools.

A special case in which organic heart disease affects the mind is that of the older patient with arteriosclerotic heart disease with or without hypertension in whom a failing circulation leads to inadequate blood supply to the brain and resulting mental deterioration. Since more and more patients are living to the age where they can acquire this type of heart disease, it is probable that i will be of increasing importance in the future.

FINAL WORD

In conclusion, the care of all patients with heart disease must include de tailed attention to their schedule of physical activities and their emotional re sponses to their illness. In some, one or both of these factors are more impor tant than any medication in the treatment of heart disease.

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A SURVEY OF RECENT DEVELOPMENTS CONCERNING THE CONCEPTS OF CORONARY DISEASE AND ITS MANAGEMENT*

LOUIS N. KATZ, M.D.

CORONARY disease is one of the most important diseases afflicting mankind As the medical profession has reduced infantile mortality, improved sanita tion, developed antibiotics and learned to deal with epidemic diseases, there has been a constant shift towards an increase in the frequency of degenerative diseases, like hypertension [high blood pressure], arteriosclerosis [hardening of the arteries], cancer, and their sequelae. Arteriosclerosis is thus becoming an ever growing problem and it will continue to grow in importance as the population becomes older. Arteriosclerosis is not a matter of aging, though i is more common in the elderly. It is a disease which affects not only old people but also middle aged people and even young people. The concept that arterio sclerosis is a disease process and not just aging should ultimately prove fruitfu in advancing our knowledge.

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Arteriosclerosis can cause disease in all parts of the body, but the statistically important forms, as far as serious consequences are concerned, are nephrosclerosis, cerebral arteriosclerosis and coronary arteriosclerosis. It is fair to say that one out of every two persons in this audience will, unless something specific is found in the interim, succumb to coronary disease. Not only is this true of the medical profession but it is likewise true of other professions and of the executives, the people upon whose intelligence the welfare of this country depends to a large extent. We do not know why it is that the male suffers more ill effects from arteriosclerosis than does the female, nor why the "brain truster" in the broadest sense withstands this disease so much less than the average male population. Some day the answers will come. Apparently one of the prices paid by an individual for becoming a professional or executive type is that his chances of succumbing to coronary disease are greatly enhanced.

The fundamental cause of arteriosclerosis is poorly understood and the specific methods available to prevent or even to retard its development are practically nonexistent. This is one of the most important basic problems in medicine. The experimental work in the field of arteriosclerosis is clear in showing that cholesterol is involved in its development and that the feeding of cholesterol with the accompanying hypercholesterolemia induces atherosclerosis in the herbivorous rabbit and the omnivorous chicken, and that, when supplemented by thiouracil, it apparently can also induce this lesion in the dog. Experimental evidence also supports the idea that strain upon the circulation facilitates its development. It appears also that thyroid secretion and potassium iodide tend to retard it, while hyperthyroidism tends to favor its development. Other factors involved in the process of experimental atherosclerosis are still controversial. In the present state of our knowledge it is not yet justified to advocate a cholesterol-poor diet in man in the hope of retarding atherosclerosis because there is reason to believe that endogenous cholesterol produced even on a cholesterol-poor diet may still lead to atherosclerosis. Recent experience in animals has suggested the possibility that macromolecular substances lead to blood vessel plaques and it may be that cholesterol operates as a macromolecular substance. Some inconclusive experiences suggest that ischemia or anoxemia of the vascular wall, which is normally richly supplied by vasa vasorum, contributes to the development of atherosclerosis. These are the problems for the future. For the present these concepts cannot yet be employed in the clinical handling of arteriosclerosis.

When we speak of coronary disease we speak statistically primarily of coronary atherosclerosis and its sequelae. However, the coronary blood vessels are subject to other diseases, such as periarteritis nodosa, thrombo-angiitis obliterans and other less clearly defined vascular diseases. Emboli, usually from preëxisting thrombi but also of material from valve vegetations, especially in subacute bacterial endocarditis, also lodge in the coronary arteries. Rheumatic

coronary endarteritis is said to occur. Syphilitic closure of the coronary ostia is common. Invasion of the coronary vessels by cancerous growth and traumatic damage to the coronary vessels are observed. I mention these other causes simply to reëmphasize that atherosclerosis, while the most important single cause of coronary disease, is not the sole cause.

Coronary sclerosis leads to ill effects by handicapping the adjustments of the coronary vessels to the needs of the heart for varying amounts of blood flow. The rigidity of these vessels which is an accompaniment of coronary sclerosis makes them less distensible and hence more poorly adapted for wide variation of blood flow such as is required to meet the ordinary and extraordinary demands put upon the heart. While coronary sclerosis tends to develop in discrete locations, rather than diffusely, this interference with distensibility is still a serious consequence. Sclerosis of a coronary vessel also leads to narrowing of the lumen and thus interferes with the blood flow to the region which it supplies.

There are compensatory blood channels, namely the intercoronary communications, arteriovenous anastomoses, Thebesian vessels and extra-cardiac collaterals, which enlarge and take over the supply of blood to the region whose coronary artery is occluded or narrowed. The adequacy of this auxiliary blood supply depends most of all upon the rapidity of the narrowing of the coronary arteries. Age is also of some importance because the coronary arteries are more nearly end arteries functionally in the young than in the old in whom these auxiliary channels have had time to develop. . . .

Coronary insufficiency, therefore, is primarily a chronic disease of benign or malignant character. More attention needs to be paid to this aspect of coronary disease despite the lure to concentrate on the more dramatic episodes of transitory coronary insufficiency and acute myocardial infarction. We need to consider coronary disease as a long term problem and to concern ourselves with this aspect of it more than we have in the past. Of course, this does not mean that we should pay less attention to the acute varieties.

In order that we may understand the rationale of prognosis and management of coronary insufficiency we must be aware (1) of the natural history of coronary disease and (2) of the factors involved in the control of the coronary circulation.

In considering the control of the coronary circulation too much attention has been directed in the past to the effects of change in caliber of the coronary vessels due to its musculature and not enough to the other factors involved. Coronary insufficiency, I believe, occurs more often by virtue of disturbances of the dynamics of coronary flow and to anatomic narrowing and obstruction of the coronary lumina than to coronary vasoconstriction or spasm. In fact, I would hazard the guess that coronary spasm is a rare occurence and coronary vasoconstriction is relatively infrequent. This is not to be taken to mean that

coronary vasodilator drugs are ineffective, but their role is to supplement coronary flow rather than to relieve vasoconstriction. . . .

My purpose in [discussing] the control of the coronary circulation has been to bring you up to date on the complexity of the factors involved in regulating the blood supply to the heart and to make you ask yourself critically whether many of the glib explanations prevalent in current clinical thinking are really true or not. The first step in the rational approach to therapy and management of coronary disease is to remove taboos and fads which tend to creep in to any field of medicine as a result of its authoritative development. It is for a similar reason that I would like to discuss the mechanism of cardiac pain.

Of course, you know that not all chest pain is cardiac in origin. Many processes tend to imitate angina pectoris and these must first be excluded in every case where any doubt exists. It is notorious that the symptomatology of coronary disease is elusive. That is one of the reasons why electrocardiography has lately gained such vogue, but even here there is a tendency to read too much into the electrocardiogram and I would not be rash in stating that all of us have erroneously diagnosed many cases of chest pain as of cardiac origin. The interpretation of the electrocardiogram is subjective and as prone to errors as any other clinical method of diagnosis. We all know that a normal electrocardiogram does not necessarily exclude coronary disease. It is becoming clearer also that many other diseases can lead to electrocardiographic distortions which are imitative of coronary patterns. A need has developed for some tests to measure the adequacy of the coronary circulation.

Two such tests are now in vogue. One is the anoxemia test which I consider too hazardous for widespread use, even though its advocates point out that the administration of oxygen will quickly alleviate its untoward effects. The other is the exercise tolerance test with which we have recently gained some experience. . . .

Angina pectoris implies the appearance of pain. The physiology of sensation is therefore applicable. This involves the determination of the pain stimulus, the location of the pain endings in the heart, the paths pursued by the pain fibers, the psycho-physiology of pain appreciation and the general physiology of referred pain.

The evidence is fairly complete that the pain substance giving rise to cardiac pain is a diffusable material which can pass in and out the blood stream readily. It is non-violate in the sense that it can pass unchanged through the lung circulation. It is formed during ischemia of heart muscle and is destroyed in the presence of an adequate blood supply. It is not clear whether it is an acid metabolite like lactic acid, phosphoric acid, pyruvic acid or succinic acid, or is a non-acid metabolite like histamine, phosphocreatine, adenosine or potassium. It appears that it can be manufactured by ischemic skeletal muscle as well as by heart muscle and this is important since the skeletal musculature

constitutes half the body mass. Because the stimulation involves end organs, the substance must accumulate in quantities above a threshold in order to stimulate the pain endings. This means that in the absence of pain, the pain-producing material need not be absent but may be at any level below the threshold. Obviously, therefore, the amount of further accumulation of pain-producing material may be variable since at one extreme there may be none of this material present beforehand and, at the other extreme, it may have already accumulated to just below the threshold level.

The pain endings in the heart, aside from those in the parietal pericardium, appear to be located only in and around the coronary vessels. It is there that the pain-producing substance must accumulate. Experience has shown that the epicardium, endocardium and myocardium are free of pain endings. The pain fibers are located in the adventitia of the coronary vessels and travel up to form a plexus around the mouths of the coronary arteries. There they are joined by pain fibers coming from the root of the aorta and others from the great vessels as well as those from the parietal pericardium. The pain fibers join the cardiac plexuses in the mediastinum and travel to the spinal cord and medulla via the sympathetic chain and the vagi, and eventually reach that part of the cortex where the sensorium is located. Pain fibers and other fibers from somatic regions of the same segmental area join these visceral pain fibers at various levels so that at the sensorium there is a final common terminal for these visceral and more commonly experienced somatic sensations.

The pain endings of the heart, like other end organs of sensation, may vary in the level of their threshold, that is they may require more or less of the pain producing substance to stimulate them under different circumstances. This variability may result from coronary disease. Mild degrees of ischemia may make the end organs more sensitive; greater degrees may dull them and even destroy them. Disease may also affect the pain pathways of the heart. Since arteriosclerosis involves the vasa vasorum nourishing the adventitia of the coronary vessels it is possible that the disease process may irritate these fibers and so lead to stimuli engendered at these irritable foci rather than at the nerve endings themselves. More advanced disease may inhibit the transmission of nerve impulses over these pain fibers and may even destroy them. This is another variable in the development of pain sensations from the heart.

People vary greatly in their ability to appreciate painful stimuli. There are hypo- and hyper-sensitive persons as far as pain is concerned. This too introduces an element of variability. It is quite likely that conditioning plays an important role in making the pain sensation obtained more readily appreciated. It would appear that the more often painful stimuli occur, the more often angina will develop, that is, the more readily pain can be appreciated. It follows, therefore, that any procedure that will keep a patient free from anginal attacks will, as it were, uncondition him and make it harder for anginal pain to recur.

One of the peculiarities which heart pain shares with all referred pain is that it is referred to somatic areas from which the person is more accustomed to perceive sensation than from the heart. This you are all aware of by virtue of the classical and less common somatic distribution of pain of cardiac origin. It would take us too far afield to enter into the matter of referred pain. However, I wish to stress that irritation in the aorta, in other visceral organs and in somatic areas may make anginal pain appear more easily. Impulses coming from somatic areas may summate in the final common terminal with those from the heart and so require less pain stimulation of the heart to give rise to the sensation of cardiac pain. We have been able to show that exercising the left hand in patients susceptible to angina, while the blood supply to the hand is cut off by a blood pressure cuff, can often induce a typical minor anginal syndrome. Apparently the painful stimulation from the hand summates with the subthreshold stimulation of the heart so that the two together can be appreciated by the sensorium as pain.

These few remarks on the pathogenesis of pain should orient the clinician in his interpretation of the meaning of this sensation. He should appreciate that just because cardiac pain is a threshold phenomenon, the appearance of pain will come on and wax briskly since the heart is constantly beating. This does not imply that angina is due to coronary spasm. Any circumstance which causes a rapid accumulation of pain-producing substances will lead suddenly to the appearance of pain. This concept of angina pectoris will help the clinician to explain the otherwise inexplicable lack of relationship of anginal pain to effort, why sometimes little effort leads to pain and at other times in the same patient much greater effort does not. It is the state of the nervous system and the rate of accumulation and disposal of the pain-producing material that accounts for this variability. . . .

I am sure that by this time you have begun to ask yourselves how these fundamental problems help in the diagnosis, prognosis and management of coronary disease. As for diagnosis, what I have said shows why history alone may often be misleading, why there is need for objective tests. Much remains to be done in this field, but with the consideration and exclusion of other causes of these symptoms, with the aid of properly analyzed electrocardiograms, and with such procedures as the exercise test, the diagnosis of coronary disease may become more precise.

As to prognosis, it is obvious that the clinician must become familiar with the average development in coronary disease. He must recognize that about one-fifth of the cases of recent myocardial infarction die during their hospital stay; that the average expectancy of life, following an infarct is five years, but that the scatter is quite large. We have seen cases who have lived very comfortably for over 20 years following an infarction. We are all aware of the fact that the factors which determine the prognosis in recent myocardial in-

farction and in other forms of coronary disease are still too poorly understood for us to be able to prognosticate accurately in a given patient. It is true that those people who develop a marked drop in blood pressure or go into shock have a poor prognosis. It is true that the development of congestive heart failure carries with it a serious outlook. It is true that the presence of diabetes adds to the gravity of the outlook. Nevertheless we do not know how to prognosticate precisely how long a given patient with coronary disease will live. It is therefore unwise to give a poor prognosis. Too many patients with coronary disease are frightened unnecessarily by their physicians and many who otherwise might lead a useful and happy existence are made miserable and useless by an unjustified poor prognosis.

Of course, the patient should have his affairs in order, should be moderate in his undertakings, should learn how to play as well as how to slow up in his work, how to cut down and avoid peak loads, how to develop a carefree attitude, how to keep his weight down to normal—in short, he should learn how to live. But to take him away entirely from his life's occupation, to let him live on disability insurance, is in most cases unnecessary and even harmful. Ninety-five per cent of all coronary fatalities appear to occur without precipitating cause, many occur during bed rest or sleep. In our present state of knowledge we know too little of how to prevent the further progress of atherosclerosis and its sequelae to warrant prohibitions. . . .

I would like to emphasize that I consider myocardial infarction a self-limited disease, a process which by the time the clinician sees the case is ordinarily already a matter of convalescence, that four out of five patients will survive the episode, and that most of them will have little if any handicap. Some of course will develop chronic coronary insufficiency, but others will be completely restored and have, at most, only the psychological fear that all lay people and too many physicians attach to coronary episodes. I think all of us should practice the psychology of hope. There has been too much of the psychology of fear.

As already hinted the primary management problem in coronary disease is to deal with chronic coronary insufficiency. This is a problem involving more than medication. It is a problem in which the physician has to survey with his patient the entire mode of his existence and to try to create a proper philosophy of living. This should be adapted to the temperament of the patient. The fearful one will have to be reassured, the domineering one will have to be taken down a peg or so. It is in this field that a sympathetic approach, the spending of sufficient time to delve into the patient's problems and the constant repetition of the theme of proper living at different visits will repay the effort involved. It is here that the physician can practice the true art of medicine. It is my view that mismanagement arises from the lack of time spent with a patient in going over all aspects of his activities. Since we know of no real

way of retarding arteriosclerosis and since we know of no way of predicting when the next coronary attack will come nor whether or not it will be fatal, we should view with grave suspicion any tendencies on our part to impose on him undue prohibitions.

It is the experience of all that undue exertion and undue emotion may precipitate angina and even a myocardial infarct. The particular circumstances that seem to act as trigger mechanisms for angina should be thoroughly explored in each case and ways devised to avoid them. . . .

Tobacco should be discouraged in coronary disease. It leads to vascular narrowing, presumably including the coronary vessels. Alcohol on the contrary should be encouraged. Port wine is a good hypnotic. A cocktail or two can make people see life in a more pleasant manner and helps them to relax. Wines with meals should be encouraged. Alcohol leads to dilatation of blood vessels and presumably this effects the coronary arteries as well. I find that permission by the physician for the patient to indulge in alcohol makes other restraints more tolerable. As to diet the key is moderation. There is no specific food which needs to be avoided. The patient, however, should reduce his weight when he is overweight. When the "coronary" patient has diabetes, the diabetes should be treated moderately. We have found that rigid control of the diabetes actually leads to more frequent anginal attacks and when the control is less rigid the patients do better.

Rest is an important item in management. Some people do well when they are encouraged to take a rest period (or even a nap) during the day. It breaks the tension under which the high powered executive lives. Frequent excursions and holidays are in order. The patient should undertake to keep himself fit by a program of graded exercise. This may include walking, golf and similar activities. These should be indulged in up to the point of tolerance, that is short of the point of fatigue, pain or shortness of breath. Inactivity makes even the healthy person physically unfit. One cannot avoid peaks of exertion or emotional stress in the environment in which most of us live. This is true also of the patient with coronary disease who does not lead an entirely sheltered life, and most of them should not. It, therefore, behooves the patient to put himself in as good a physical condition as possible. When properly carried out, it is amazing how much improvement in physical capacity can be attained. In this program of graded exercise, caution should be used. A sense of competition, even with his own par, should be avoided. Any competitive exercise, which tends to make individuals do more than they should, should be avoided. The patient should be encouraged to stop his effort when he feels he has had enough. Incidentally, a game of cards may, by its competitive character, be more harmful than a long walk or fishing!

The nitrites are extremely useful in coronary insufficiency. Nitroglycerine has stood up best of all. Patients soon learn how to help alleviate their anginal

attacks with nitroglycerine under the tongue. Nitroglycerine, furthermore, may be employed prophylactically. It may be taken a half hour before an interview or other activity which the patient can not avoid and which he has found is apt to lead to anginal attack.

The handling of congestive heart failure complicating coronary disease is no different from the treatment of congestive failure of any origin and there are no contraindications to the use of digitalis or mercurial diuretics, provided there is an indication for their employment.

Status angiosus may require protracted bed rest. It is amazing how often a period of bed rest at home or in the hospital improves the condition of the patient for a period long after the rest has been completed. When rest is ineffective, alcohol injection of the left (or right) stellate ganglion may lead to remarkable alleviation of status angiosus. It does not remove all the warning signals of overactivity. The patient should be taught to look for dyspnea, fatigue and other signs indicating that he is doing too much to replace his dependence on pain as a warning. Total thyroidectomy and the Beck operation have not come up to expectations and are rarely if ever justified for angina pectoris. . . .

In this survey I have tried to cover only a few of the main points in recent concepts of coronary disease and its management. Obviously I have dealt with many a controversial aspect and have presented a number of matters which are still being investigated. I have not hesitated to express my own views, realizing full well that in many places I am not in accord with current beliefs and fads. I have done so because these are my convictions, based on a survey of the literature and personal experience in the laboratory and as an observer and experimenter at the bedside. In closing, I would like to emphasize once again that, great as have been our advances in this important affliction of man, there is still need for much further exploration. If the next decade will be as fruitful as the last, we can surely say that our concepts in management of coronary disease will advance tremendously. The ultimate solution, however, which should resolve this problem is one of basic research seeking to answer the query—what is the cause of atherosclerosis? Furthermore, we need some knowledge regarding the manner in which atherosclerosis can be retarded, and it is not too much to believe that ultimately, perhaps in our lifetime, we will know how to prevent atherosclerosis and thus finally to allow people to die merely of real old age.

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